Trigen-Peoples District Energy Company – McCormick Place

Background

Trigen is a developer, owner, and operator of industrial, commercial, institutional, and district energy systems in North America. In 1992, the Chicago Metropolitan Pier and Exposition Authority (MPEA) was planning a 2.2 million square-foot expansion to its 2.8 million square-foot McCormick Place Exhibition and Convention Center and sought to outsource the operation of its existing energy plant and its future energy needs. Trigen partnered with Peoples Energy Corporation to provide the McCormick Place facility with heating, cooling, and power for the duration of the 29-year contract.

In 1997, the contract was expanded to include servicing the new 32-story, 800-room Hyatt Regency Hotel with heating, air conditioning, and domestic hot water. In 2000, the contract was again expanded to provide heating and cooling to the new 250,000 square foot conference center and corporate office complex.

Project Description

Trigen achieved higher efficiencies over the older heating and cooling system by adding three trigeneration machines and a Thermal Energy Storage (TES) system to the original system design. Each trigeneration machine is a combination of a natural gas fueled turbine, a motor/generator, a heat recovery steam generator, and an ammonia screw compressor. This design allows for the simultaneous production of electricity, chilled water, and steam from a single steam source. The TES system is an 8.5 million-gallon chilled water tank (the largest in North America) measuring 127 feet in diameter. Chilled water (Trigen's antifreeze additive increases the effective chilling storage capacity by 50%) is produced during the night for use during daytime peak cooling loads. This results in fewer chillers being online during the day with those in operation functioning at higher efficiency. Trigen also added steam absorption chillers to use excess steam generated during summer months thereby enabling chilled water production without the use of CFC refrigerants.

Trigen Energy Corporation – Chicago, IL*	
Project Design Capacity (MW_e)	3
Power to Heat Ratio	0.12
Total Net Efficiency (HHV)	84%
% Fuel Savings[1]	11% (1,600 metric tons of carbon)
% NOx Decrease[2]	67% (63 tons)

∗*Data based on 8,760 annual hours of operation*

[1] Savings based on 50% efficient electric and 80% efficient thermal generation with natural gas as the primary fuel.
[2] Compared to electric emissions of 3.6 lb NO_x/MWh (1998 national average) and boiler emissions of 0.1 lb NO_x/MMBtu.

Success Strategy

Trigen partnered with Peoples Energy Corporation to own and operate the energy plant by agreeing to a long-term energy supply contract with MPEA. This allowed MPEA to avoid the $27 million capital outlay required to upgrade the heating and cooling facilities. Additionally, the system design takes advantage of daily and seasonal changes in gas and electric prices, further reducing operating expenditures.

Benefits

The cogeneration facility meets the heating and cooling needs of the McCormick Place Convention Center located in Chicago's Park District. This not only saves MPEA $1 million annually, but also allows them to focus on their core business of serving more than 4 million visitors each year.

The efficiency improvements have provided a substantial environmental benefit as well – saving 110 million standard cubic feet of natural gas a year and annual emissions of carbon dioxide are 6,400 tons lower than separate heat and power. This is equivalent to planting 1,700 acres of forest or displacing the annual greenhouse gas emissions from 570 households. The avoided annual NO_x emission is equivalent to the annual emissions from 3,200 vehicles.

In March 2000, the United States Environmental Protection Agency and the Department of Energy recognized the pollution prevention benefits of this CHP facility with an ENERGY STAR® CHP Award. For more information on ENERGY STAR® CHP awards, please click here.